EXPERT INSIGHT FOR HANDSET SUBSCRIBERS

Does 5G Speed Matter?

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Introduction

Our title question is almost sacrilege in the mobile industry. For 25 years, we have been striving for faster data speeds, from 12 kbps in GSM to over 1 Gbps today. During 3G and 4G days, the connection speed was the single most important factor in promoting a new phone.

But today, things are different. Look up the Samsung Galaxy S10 and other 5G phones on the Web. Even though these are 5G phones, the features mentioned most prominently are the cameras and the high-resolution display.

This report investigates the question of whether handset OEMs should spend money and effort to upgrade the data speed in a handset. We ask two questions separately:

a) Will consumers buy a 5G phone, simply because it's labeled as "5G"?
b) Will consumers pay more for a phone with a faster peak connection speed?

Background

Let's look at some case studies from the past:

1994: 2G: The baseline of 12 kbps didn't support much, and the only real use cases were voice and text.

2003: 3G: The boost to 380 kbps enabled email, but many people were disappointed by the slow speed and its inability to support photos, maps/navigation, and other features.

2012: LTE: The introduction of LTE and its speed boost fixed the problems of 3G and companies like Uber rocketed upward. Real-time maps and photo-based applications became commonplace.

2015: LTE-Advanced: Boosting LTE to a few hundred Mbps helped for capacity, and drove the average experience from 1-2 Mbps to the level of about 20-40 Mbps. On-demand video became routine.

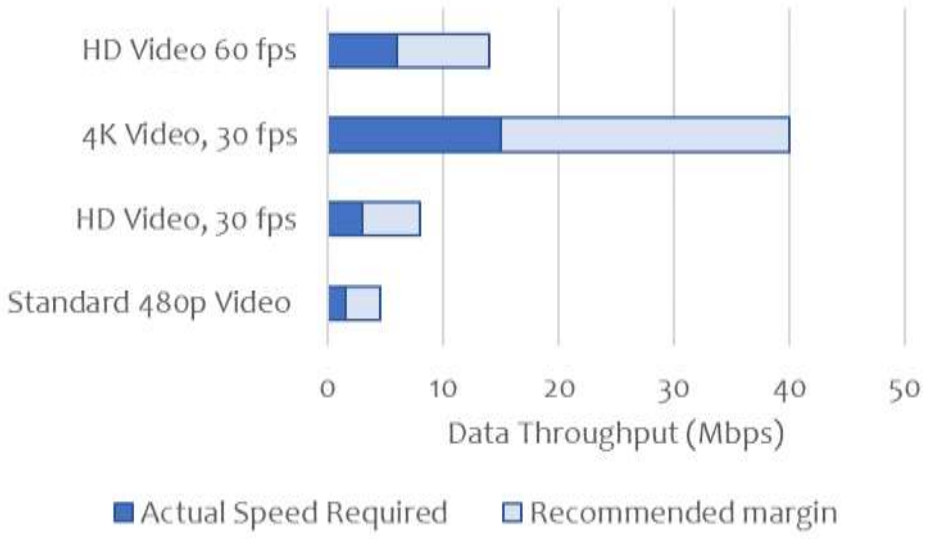
2019: 5G mm-wave: Verizon, AT&T, and T-Mobile have launched 5G services using mm-wave radios, and the service is now available in at least 20 cities between all three

carriers. Samsung, LG, and Motorola offer handsets with mm-wave radios and all have peak speed capability in the gigabit range. But sales of these handsets have been disappointing, with only about 50-60,000 handsets sold from April 3 through November 1, 2019.

Applications

As we have seen, for many years the applications justified the premium connection speed of new handsets. It wasn't the speed by itself: It was the ability to do something that was not possible before. The rise in capabilities and new applications also drove the replacement cycle, as people bought new phones every 18 months.

Today, every new app that we have evaluated can be satisfied with LTE. Even movie downloads and Dropbox synchronization can be handled pretty well with LTE-Advanced connections (4x4 MIMO and LAA) where peak speed clocks in around 1 Gbps.



Source: Netflix/Hulu/Amazon

Figure 1 Throughput requirements for streaming video

Many people say that the apps will appear… that after the networks are available, we will discover what people can do with the additional bandwidth. We disagree. In 2003, when the first 3G networks had been launched, the BlackBerry was already established in the two-way pager format, and was pushing to enter the mobile email market. In 2011, when the first LTE networks were launched, Google Maps had been used for six years as

a PC-based application. Uber had been commercially launched for two years. In each case, when the networks were commercially launched, the value of these applications became clear and obvious.

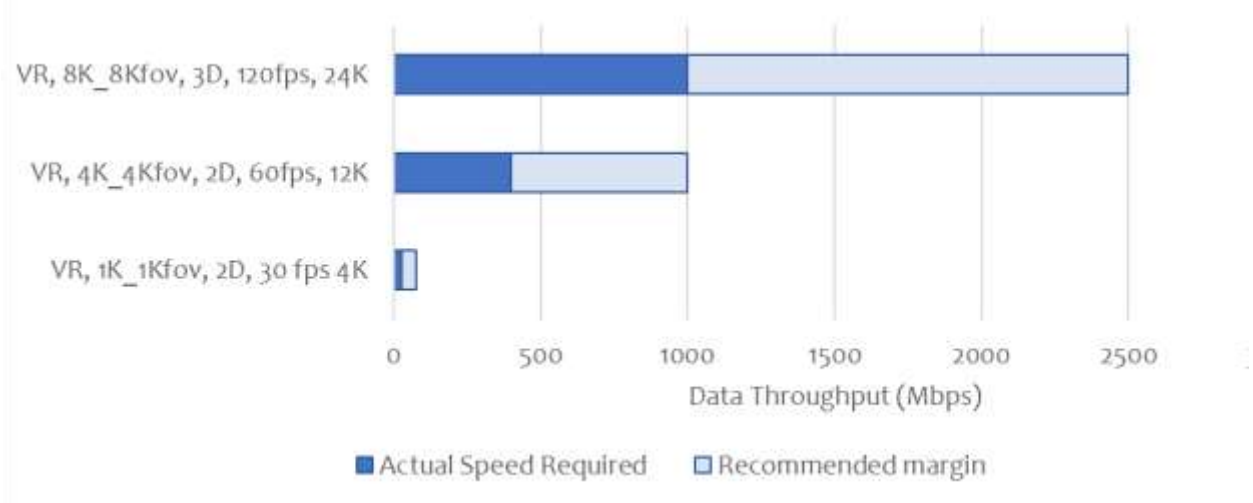
Today, there are no applications that are straining for 5G performance, with clear everyday use cases like Uber or mobile email. There are some examples that could develop into everyday use cases: Holograms, movie downloads, and filesharing are all possibilities that have potential, but which are only niche applications used rarely today. VR could become a mainstream form of entertainment. It's possible that these could become instrumental to everyday life in time.

Virtual Reality

The most likely candidate for everyday use is Virtual Reality. We have been pretty skeptical about VR for mobile connectivity, because we've only seen VR used in a living-room scenario, not in a mobile scenario.

Note that Google recently announced that they will discontinue support of VR based on their handsets. The Pixel 4 does not support their Daydream VR platform, and they're shutting down development of Daydream so even its support on old Google phones is moot now. So VR is not a slam-dunk. VR may succeed independently of smartphones, with wired or other short-range connections… or on completely new platforms.

So, we are skeptical, but if we assume for the sake of analysis that VR will become a mobile application, here are some expected performance requirements. The use of a wide 8K field of view, with 120 frame-per-second refresh rate, and 24K resolution would drive a 1 Gbps stream. A more realistic 4K video stream refreshed at 30 fps would clock in at 25 Mbps. So, over time the VR market could grow into requirements for hundreds of megabits per second. Our view is that a success case for VR involves growth to a 12K/60fps stream over the next eight years.



Source: Vodafone/Huawei, VR/AR Network '17, August 25, 2017, Los Angeles, CA, USA

Figure 2 Expected throughput requirements for VR

Consumer attitudes

We conducted an informal poll of 40 American consumers recently, of which 14 people subscribe to AT&T Wireless services. Of the AT&T customers, 12 of 14 had noticed the use of the "5GE" logo on their smartphone or on TV ads. Only one of these 12 people was aware of the significance of 4G and 5GE (namely, that 5GE is another term for LTE-Advanced which will lead to 5G someday). In other words, 13 of 14 AT&T customers didn't know what 5GE meant, or had any idea what data speed they actually achieved.

This is significant: People like the idea of "5G", but they really don't know what speed they achieve and they don't really care to look. Here is the interesting part: 11 of 12 AT&T customers polled thought that they actually had a 5G phone, and believed that they had faster speeds than a Verizon "4G LTE" user with the same phone model.

Advertising is another way to track consumer focus. We reviewed three current iPhone 11 television ads. The focus:

- Camera: Video of singer Selena Gomez.
- Camera: Showing multiple different camera modes and lenses
- Ruggedness: Showing the iPhone bombarded by rubber ducks and wedding cake
- Bonus: Looking at the longer Youtube video that "introduces" the iPhone 11, the company highlights many different features:
    - Wide angle lens
    - Ruggedness

- Waterproof
- Video quality
- Slow-motion video
- Face ID security
- Night mode camera
- Fast chip for gaming
- Retina Display
- Battery life

Notably, in all of the Apple ads, connection speed is *never mentioned.* The chip speed is noted in its longer ad, but only with regard to gaming on the handset, not related to connection speed.

Looking at other companies, the websites selling premium smartphones can be revealing.

Verizon's website features multiple 5G handsets: Samsung's S10 5G, S10+ 5G, the LG V50 ThinQ 5G, Motorola's Moto z3, and a hotspot. But closer examination of each of these items shows that Verizon makes no claims at all about speed. They simply say that these devices can access "Ultra Wideband" 5G. So this is interesting: The marketing people think that the buzzword is important, but promoting the actual performance is not important.

Design and product decisions

Here's another revealing example which shows the priorities set by Apple. For the iPhone X series, Apple had SKUs that were supported by both Qualcomm and Intel. The Qualcomm modem was ready for 4x4 MIMO in 2017, but the Intel modem couldn't support 4x4 MIMO. Apple decided to go forward with 2x2 MIMO on both models, so that various SKUs would be at 'parity' in performance. So, Apple had an opportunity to use 4x4 MIMO and the higher speeds with the Qualcomm model, but chose not to implement it. This is simply one more data point to indicate that connection speed is not very important to the consumer market.

Huawei

One last data point to examine with regard to speed: Huawei made some major changes to their product line during 2019. Huawei was cut off from the purchase of US

semiconductors, so they cut back on features such as Carrier Aggregation (and possibly LAA) in order to build phones without complex American quadplexers or antenna-plexers. The discrete RF front end components available from Chinese and Japanese suppliers left Huawei with phones that could only support reduced speeds. No more gigabit phones.

But Huawei has sold more phones than ever this year. Their shipments rose 29% year-over-year to 67 million units in Q3 2019, based on a wave of "patriotic buying" in China. Was this procurement sponsored, subsidized, or even coerced by the Chinese government? Maybe. Even probably. We have no proof of that. But the fact remains that Huawei sold more slow phones than their competitors (Apple, Xiaomi, Samsung) selling faster phones. Speed is clearly not the top priority in China this year.

Conclusion

We've tried to be careful not to make a conclusion based only on a single dimension. In our examination of consumer focus, smartphone sales, OEM decisions, and application requirements, we find evidence that aligns for a surprising conclusion: Above about 100 Mbps, speed doesn't translate into value.

This is not to say that faster speed has no value for the mobile operator. The operators need high throughput in order to boost capacity on limited spectrum. But there's no value for their customers… so our conclusion is that in the 5G era, the operators will need to subsidize any costs associated with high speed.